EXPLORING PRESSURE AND BODY POSITIONING: A PILOT EVALUATION AMONG CRITICALLY ILL PATIENTS

Fiona Coyer[1,2,3], Michele Clark[2], Peter Slattery[1], Peter Thomas[1], Greg McNamara[1], Chris Edwards[2], Jessica Ingleman[2], John Stephenson[3], Karen Ousey[3].

1. Royal Brisbane and Women's Hospital, Brisbane, Queensland, Australia.
2. Queensland University of Technology, Brisbane, Queensland, Australia.
3. University of Huddersfield, Huddersfield, West Yorkshire, UK.

Queensland University of Technology
Brisbane Australia

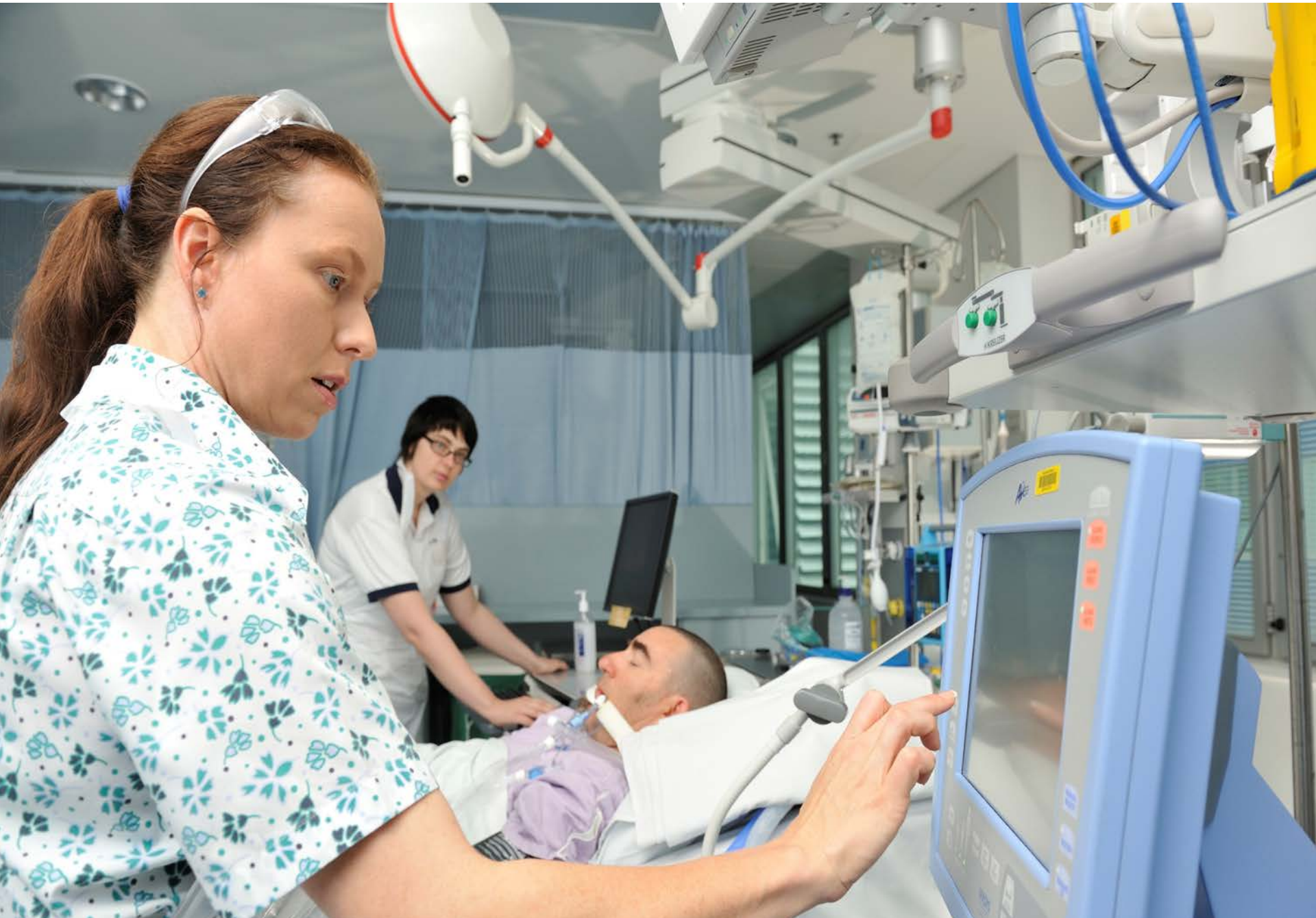
Queensland Government
Queensland Health

University of HUDDERSFIELD

Aims

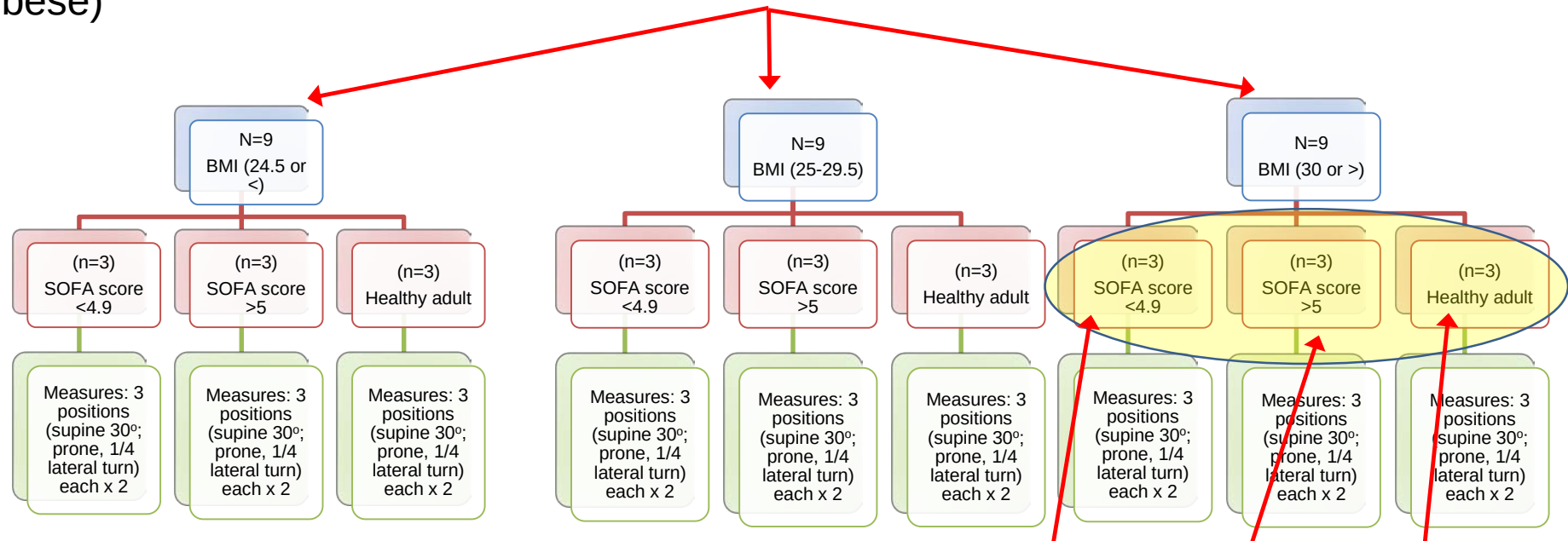
- To investigate the effect of body mass index (BMI), severity of illness, positioning, age and risk of PI development on pressure displacement and interface pressure (IP)

Source: http://www.heart-valve-surgery.com/Images/icu-tubes.jpg



Participants

Participants aged >18 years sub-divided by BMI category (normal, overweight and obese)



Participants further sub-divided by health status based on sequential organ failure assessment (SOFA) score →

high acuity (SOFA≥4.5)

low acuity (SOFA<4.5)

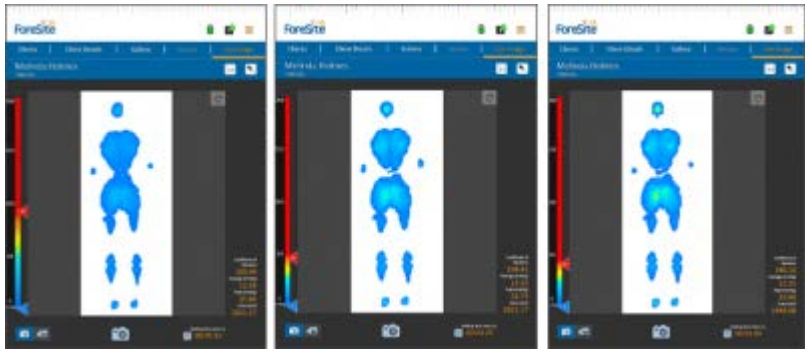
healthy adults (no SOFA score)

Patients with burn injuries (>40% total burn surface area) excluded from study

Measures

- Primary outcome measures

1. Interface pressure (IP)
   - Xsensor X3 pressure mapping system - full body sensor mat (81cm x 203cm); 1,664 capacitive pressure sensors
   - IP measured as peak pressure index (**PPI**) and defined as highest recorded value with a 9-10 cm^2 area
     - approximate contact area of a bony prominence.



Variables

All participants

- Age
- Gender
- Comorbidities
- Body mass index

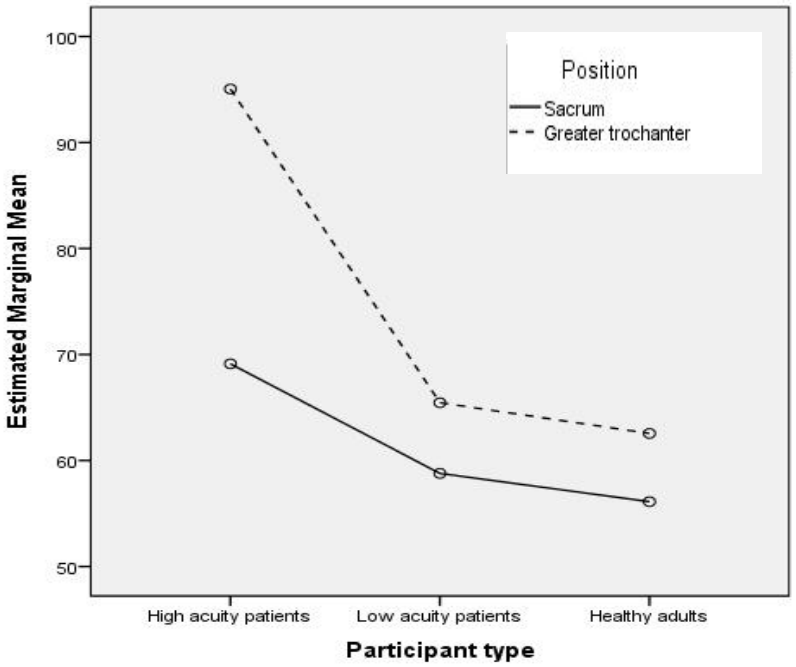
Critically ill patients only

- Diagnosis
- ICU length of stay
- Acuity
  - Sequential organ failure assessment (SOFA) score
- Braden scale score
  - Risk assessment for pressure injury development

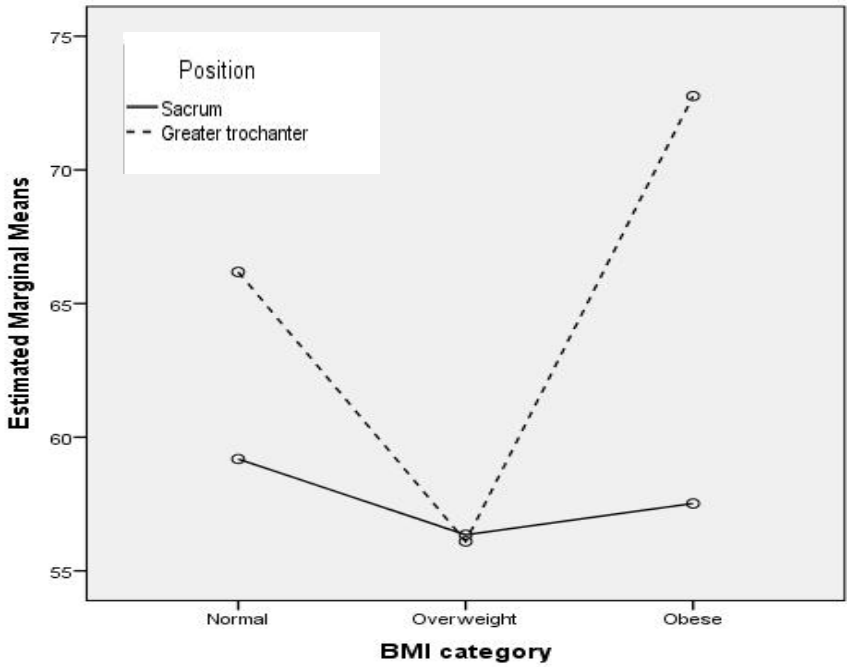
Results - Participant characteristics

- Mean participant age 50 years (SD 18.3) years
- 58% male
- Healthy adults all non-smokers; no comorbidities
  - Healthy adults about 20 years younger than ICU patients
  - Age confounded with patient type
  - Need to control for age in models assessing effect of acuity
- Median Braden scale score 13 (IQR: 11-23) for ICU patients
- Median length of ICU stay 14.5 (IQR: 8.0-20.5) days

Results: Variation in PPI with SOFA and BMI



PPI values vary between patient types
Lower values in healthy adults and low acuity patients
Higher values recorded at greater trochanter than at sacrum



PPI values vary between patients with different BMI levels
Higher values recorded at greater trochanter than at sacrum

Summary of analysis of PPI data

- Participant type substantively related to PPI at sacrum and greater trochanter assessed jointly (p=0.093)
- PPI values for high acuity patients 13.1 mmHg higher (95% CI -17.1 to 43.1 mmHg) at sacrum and 32.5 mmHg higher (95% CI -5.03 to 70.0 mmHg) at greater trochanter than for healthy adults
- PPI values for low acuity patients 2.67 mmHg higher (95% CI -17.5 to 22.9 mmHg) at sacrum and 2.90 mmHg higher (95% CI -22.3 to 28.1 mmHg) at greater trochanter than for healthy adults
- Model controlled for age; statistically significant (p=0.008)
  - Moderate to large effect (partial-η^2=0.351)
- No evidence of association between PPI and either BMI or patient type; or either Braden or SOFA scores (ICU patients only)

Conclusion and recommendations

- Peak pressure index is an under-reported phenomenon in the critically ill patient population and literature
- This pilot analysis has determined several associations of importance
  - Substantive differences in outcomes observed between low- and high-acuity ICU patients; and between ICU patients and healthy volunteers.
  - Variation in IPs for sacral and greater trochanter areas depend on BMI categories and level of participants' health status
- Further work is recommended on a larger scale in the critically ill patient population using 'real time' periods of load to provide indication of optimum repositioning time for these vulnerable patients

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thank you!